U.S. Department
of Transportation

**Federal Aviation
Administration**

Memorandum

Subject: Action: Review and Concurrence, Equivalent Level of Safety Finding for the Learjet, Inc. DAS Aircraft Interior Modification to a Bombardier Aerospace Model BD-100-1A10. DAS Project Number: P001-CBJ01

Date: October 7, 2003

From: Manager, Airframe and Cabin Safety Branch, ANM-115

Reply to Attn. of: Albert Lam, ANM-130L

To: Manager, Los Angeles Aircraft Certification Office, ANM-100L

ELOS Memo #: ANM-113-04-01

Background

Sections 25.811 and 25.812 have size and location requirements for emergency exit marking and locator signs. Bombardier Aerospace letter, dated May 7, 2003, (reference Memo #605786NM-03-40) requests an equivalent level of safety finding to allow smaller exit signs and different sign locations on custom interiors of Bombardier Aerospace BD-100-1A10 (Challenger 300) airplanes. Bombardier Aerospace requests that the equivalent level of safety finding be documented in the Type Certificate Data Sheet T00005NY.

Due to the low ceiling height of the BD-100-1A10 airplane, Bombardier Aerospace has proposed to install an emergency exit locator sign on the aft-facing, upper-inboard edge of a left-hand entryway wardrobe cabinet just forward of the Type I entry door/emergency exit. This sign does not meet the size requirements of § 25.812(b)(1)(i). Bombardier Aerospace also proposed to install a single, wedge shaped exit sign to serve the function of both the exit marking sign and the exit locator sign at the Type III overwing exit. This sign does not meet the size requirements of § 25.812(b)(1)(i) and is installed somewhat low for its location to be considered overhead, as is required by § 25.811(d)(1) for an exit locator sign.

The certification basis of the BD-100-1A10 airplane requires compliance with §§ 25.811(d) and 25.812(b) at Amendment 25-88. The BD-100-1A10 airplane is certified for a maximum passenger capacity of sixteen as specified in Type Certificate Data Sheet T00005NY. The emergency exit configuration for the BD-100-1A10 airplane is a Type I emergency exit on the left hand side of the fuselage at stations 344.62 to 375.50 and a Type III overwing emergency exit on the right hand side of the fuselage at stations 535.18 to 555.18.

Section 25.811(d)(1) requires an exit locator sign to be installed above the aisle near each passenger emergency exit, or at another overhead location if it is more practical because

of low headroom, except that one sign may serve more than one exit if each exit can be seen readily from the sign. Section 25.811(d)(2) requires an exit marking sign to be installed next to each passenger emergency exit, except that one sign may serve two such exits if they both can be seen readily from the sign. In addition, § 25.812(b)(1)(i) requires each exit locator sign required by § 25.811(d)(1) and each marking sign required by § 25.811(d)(2) to have red letters at least 1 ½ inches high on an illuminated white background, and to have an area of a least 21 square inches excluding the letters.

Bombardier Aerospace has requested an equivalent safety finding from § 25.811(d)(2), but a non-compliance with this rule has not been identified. The FAA position is based on the non-compliance identified in this document.

Applicable regulation(s)

§§ 25.811(d)(1) and 25.812(b)(1)(i)

Regulation(s) requiring an ELOS

§§ 25.811(d)(1) and 25.812(b)(1)(i)

Description of compensating design features or alternative standards which allow the granting of the ELOS (including design changes, limitations or equipment need for equivalency)

Due to the small fuselage size of the BD-100-1A10 airplane, Bombardier Aerospace proposes the following:

1. Type I Emergency Exit Locator Sign: Install an internally electrically-illuminated exit locator sign on the aft-face, upper-inboard edge of the left hand wardrobe cabinet just forward of the Type I exit, instead of over the aisle, due to low headroom and head strike potential. This locator sign does not meet the size requirements of § 25.812(b)(1)(i). It is 2" X 5" with 1" high, red letters on a translucent white background.

2. Type III Emergency Exit Locator/Marker Sign: Install an internally electrically-illuminated wedge shaped exit sign to serve the function of both the exit marking sign and the exit location sign at the Type III overwing exit. It is proposed to be installed on the sidewall panel just forward of the exit, instead of above the aisle or at an overhead location, due to low headroom and head strike potential. This sign does not meet the size requirements of § 25.812(b)(1)(i) and is installed somewhat low for its location to be considered overhead, as is required by § 25.811(d)(1) for an exit locator sign.

Explanation of how design features or alternative standards provide an equivalent level of safety to the level of safety intended by the regulation

Although marker and locator signs share common attributes of size, brightness, etc., the two signs address two entirely separate concerns, as described in § 25.811:

a. Marker signs are intended to provide a means of identifying an exit from the aisle in the vicinity of the exit. In recognition of this intended function, marker signs are characteristically mounted flush with the sidewall in the immediate vicinity of the exit, and are easily read from the aisle near the exit.

b. Locator signs are intended to provide a means to identify the longitudinal location of an exit while approaching along the aisle, and are intended to be located above the aisle near the exit, or at another overhead location if it is more practical due to low headroom. In recognition of this intended function, locator signs are characteristically installed on the ceiling above the aisle, are oriented crossways to the aisle, and are easily legible from all points along the aisle (including the extreme ends).

Bombardier Aerospace has proposed to combine an exit locator sign and exit marker sign into one sign by combining two exit signs into a wedge shaped assembly. The forward and aft projection of this wedge shaped sign will represent the "locator sign" and the inboard projection will represent the "marker sign". This sign will be installed at the Type III overwing exit and will be demonstrated to meet § 25.811(d)(1), except for its location which is somewhat low to be considered overhead, and § 25.811(d)(2). The intent of § 25.811(d) is that the exit sign be visible to occupants approaching along the main passenger aisle. The FAA considers that an equivalent safety finding to address the issue of the proposed sign location is warranted for airplanes with a cabin width and aisle length similar to that of the BD-100-1A10 airplane, when the sign is visible to occupants approaching along the main aisle with the seats occupied by persons the size of a 95th percentile male.

An evaluation must be conducted to determine if an equivalent level of safety is provided to address the non-compliances identified in the "Background" section of this issue paper. The proposed signs must be evaluated on representative interior installations, which are to be conformed, including the sign installations. These evaluations are to be accomplished during a FAA conducted compliance inspection. Acceptability of the installations are subject to the following:

a. The legibility of the exit marker and locator signs must be confirmed by person(s) with 20/20 (or worst) eyesight. It must be determined that the signs are legible by occupants ranging from 5th percentile (in height) female (approximately 5' 2") to a 95th percentile (in height) male (approximately 6' 1"). The evaluation of each marker sign is to be accomplished from a standing position in the aisle opposite the exit. The evaluation of each locator sign is to be accomplished from all standing locations in the aisle, forward or aft of the sign, as appropriate. All seats within close proximity of the

Type III exit must be occupied by persons, who are the height of a 95th percentile male, when evaluating the location of the wedge shaped exit locator/marker sign. The signs should be illuminated during the evaluation.

The background area and height of the signs are substantially less than required by § 25.812(b)(1)(i). This could result in insufficient color contrast between the sign's letters and its background area due to the surrounding airplane surface acting as the background area. In order to ensure legibility of the word "EXIT", the evaluation must consider either two worst case scenarios of background color or the existing background color but be subject to re-evaluation per a limitation on the STC every time the background color changes. For the worse case scenario option, the first evaluation must be conducted with an aircraft background color that is the same color as the sign's letters (representing the worst case for a lighted cabin). The second evaluation must be conducted with an aircraft background color of black (representing a dark cabin).

b. The illumination levels of the signs must be shown to meet the requirements of § 25.812(b)(1)(i).

If the signs are found satisfactory by this evaluation, an ESF to the requirements of §§ 25.811(d)(1) and 25.812(b)(1)(i) is granted.

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned Equivalent Level of Safety Finding in issue paper SE-3. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Airplane Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number should be listed in the Type Certificate Data Sheet under the Certification Basis section (TC's & ATC's) or on page 3 of the STC Certificate.

[E.g. Equivalent Safety Findings have been made for the following regulations: §§25.811(d)(1) and 25.812(b)(1)(i), Emergency Exit Signs. (documented in TAD ELOS Memo ANM-113-04-01, dated 10/7/03)]

Original signed by Alan Sinclair for Franklin Tiangsing — *10/7/03*

Manager, Airframe and Cabin Safety Branch, ANM-115 — Date

ELOS Originated by LA ACO:	Project Engineer Albert Lam	Routing Symbol ANM-130L